Remarks

In the final Office Action mailed December 3, 2003:

1. Claims 1-3, 5-7, 9-22 and 24-32 were rejected under 35 U.S.C. § 103(a) in view of U.S. Patent No. 5,844,890 (Delp); and
2. Claim 8 was rejected under 35 U.S.C. § 103(a) in view of Delp and U.S. Patent No. 5,732,094 (Petersen).

I. Delp (U.S. Patent No. 5,844,890)

Delp is intended to describe "a method for scheduling cell transmissions that provides proportional use of available network bandwidth" (column 1, lines 22-24). Because Delp is concerned with proportional use of network bandwidth, and does not allow dynamic adjustment of the amount of data a channel can transmit, it cannot make obvious the claimed embodiments of Applicant's invention.

A. Delp Does Not Use Dynamic Weights Associated with Memories for Controlling How Much Data is Sent

In Delp, data cells of a data stream are stored in queues, for which target transmission times are calculated using parameters associated with the stream's logical channel (column 3, lines 31-34). Queues are assigned to appropriate time slots in the timing wheels, to attempt to meet the target transmission times (column 3, lines 34-37). Each slot apparently allows a single transmission from whichever data cell queue is assigned to the slot and is active when the slot becomes the current slot. All slots are apparently equal in the amount of data cells they allow to be scheduled.

A claimed embodiment of Applicant's invention (e.g., claim 1) employs a plurality of memories having *dynamic* weights corresponding to threshold amounts of data permitted to be scheduled during each memory's turn.

The Examiner states that "by placing a limit on the amount of time for a timing wheel, Delp provides means for maintaining a dynamic weight" for the data cell queues, "wherein the weight corresponds to a threshold amount of data according to the time and the established bit rate" (first full paragraph on page 3 of final office action).

However, each slot apparently allows the same amount of data to be transmitted, and does not change – thus, Delp does not employ *dynamic* weights, if it uses any weights at all.

Further, Delp does not associate *any* threshold timing, weight or limit with the Logical Channel Descriptors (LCDs) or the queues in which data packets are stored. The LCDs simply hold data until the timing wheels reach slots for which an LCD has been scheduled.

If it is the Examiner's contention that Delp's timing wheels have the specified threshold times associated with them, this conflicts with other claim rejections. In particular, the Examiner states in paragraph 4 of the final office action that the "plurality of memories" recited in claim 1 corresponds to Delp's "queue of data descriptors" or LCDs. But claim 1 of the application specifies that it is the plurality of memories that have dynamic weights corresponding to threshold amounts of data.

B. Delp Does Not Compare an Amount of Data Sent to a Threshold

Delp schedules data for transmission based on slots in a timing wheel (column 5, lines 62-66). The Examiner has stated that Delp teaches placing a limit or weight corresponding to a threshold time that corresponds to a threshold amount of data, wherein the threshold time corresponds to time slots in a timing wheel (first full paragraph of page 3 of the final office action).

It is therefore understood by Applicants that the Examiner is asserting that Delp associates a threshold amount of data for a queue, wherein the threshold data amount is equal to the time period represented by the time slot(s) assigned to the queue, multiplied by the bit rate.

It is therefore impossible for Delp to exceed that threshold amount of data. During each turn or slot, the cell scheduler 102 in Delp can only schedule an amount of data corresponding to the slot assigned to a given queue (i.e., the "threshold amount"), no more.

Thus, there is no comparison of data amounts in Delp. The scheduler looks in the current frame of a timing wheel, finds the active, assigned queue(s), and schedules data from the queue(s). The scheduler cannot and does not adjust the size of a slot or continue servicing a queue after its current slot has ended and the next slot has begun. Each queue's turn, or each slot, results in a set amount of data being transmitted, no more.

One or more claimed embodiments of Applicant's invention (e.g., claim 1) have been amended to demonstrate more clearly that more than the threshold amount of data may be scheduled during a memory's turn.

The Examiner cited to FIG. 7 and column 8, lines 45-67 of Delp as teaching this aspect of

Applicants' invention. "FIG. 7 is a flow chart illustrating sequential operations of the cell scheduler of the preferred embodiment of FIG. 1 *to determine a move to a next time slot*" (column 4, lines 30-32; emphasis added). Thus, FIG. 7 and the accompanying text deal with selecting a next time slot, not determining whether an amount of data scheduled for transmission exceeds a threshold amount. The accompanying text says nothing about an amount of data that has been transmitted or scheduled for transmission:

> 700: start;
> 702: search the current frame for an active bit that is on;
> 704: if no active bits that are on are found, a next frame is read;
> 706: if an active bit that is on is found, move to the corresponding slot;
> 708: done;
> 710: check whether a slow wheel boundary is crossed;
> 712: if a slow wheel boundary was crossed, start slow wheel processing as shown in FIG. 7A.

Applicants can find no mention of anything similar to the "determining" action recited in claim 1 of the application.

C. Delp does not Decrease a Threshold Amount of Data when an Amount of Data Scheduled for Transmission Exceeds the Threshold

Delp schedules data for transmission based on slots in a timing wheel (column 5, lines 62-66). The Examiner has stated that Delp teaches placing a limit or weight corresponding to a threshold time that corresponds to a threshold amount of data, wherein the threshold time corresponds to time slots in a timing wheel (first full paragraph of page 3 of the final office action).

However, the timing wheel slots of Delp apparently allow only a fixed amount of data to be scheduled. The cumulative amount of data being sent for a given queue is apparently controlled by the frequency with which the queue is assigned to a slot (e.g., FIGs. 10-13; column 11, lines 1-27). For example, the invention is described in the context of an ATM cell scheduler (column 5, lines 7-12), which requires fixed size cells (column 1, lines 54-55).

Because Delp uses fixed size time slots, Delp *cannot* decrease a threshold amount of data to be scheduled for transmission from a queue during a subsequent servicing turn. Each time the queue is scheduled, it is for a set amount of data. This is logical, as Delp is designed to provide "proportional use of available network bandwidth" (column 5, lines 14-15) for multimedia applications (column 1, lines 28-33), which are characterized by steady streams of data.

In the final office action, the Examiner stated that "by teaching adjusting the allotted time for transmission, Delp teaches adjusting the amount of data scheduled by determining an adjusted allotted time having an established bit rate." Applicants disagree and are unsure how Delp is being interpreted to "teach[ ] adjusting the allotted time."

Delp services a given queue during its assigned slot, and then schedules a next slot based on appropriate parameters (e.g., column 6, lines 43-53). Delp apparently cannot and does not adjust the size of slots in a timing wheel or the amount of data scheduled for transmission during a slot. There is no mention of decreasing the size of a slot.

Even if Delp could be interpreted as altering the *frequency* with which a queue is scheduled, Delp doesn't do so after determining whether an amount of data scheduled for transmission was greater than a threshold associated with the queue from which the data was scheduled.

D. Delp does not Monitor an Amount of Data Retrieved During Servicing

Delp does not appear to include an entity comparable to the arbiter of claim 25, which may be responsible for making the determination described in section I.B.

For this element, the Examiner cited block 720 of FIG. 7A, which is described at column 9, lines 12-18. "FIG. 7A is a flow chart illustrating exemplary steps for *processing the slow timing wheel data* of FIG. 7" (column 4, lines 33-34; emphasis added). Decision block 720 asks whether any entries remain in the current segment of the slow timing wheel. This is a Boolean test, and is answered yes or no. There is no need for, or mention of, monitoring the amount of data retrieved from a memory. In particular, the answer to block 720 would be the same regardless of whether the current segment was full of entries or contained but one entry.

And, the number of entries in the segment is merely a precursor to moving the associated LCD to a new location on either the fast or slow timing wheel. *This does not involve the retrieval of any data from the LCD.*

II. Selected Claims

A. Claims 1-3, 5-10, 32

As described above, Delp does not teach or suggest the following elements of claims 1 and 32:

maintaining a dynamic weight for each of said plurality of memories, wherein each said dynamic weight corresponds to a threshold amount of data associated with said predetermined priority;

...

retrieving data described by said received descriptor, wherein the amount of retrieved data may exceed said threshold amount;

...

determining whether an amount of data scheduled during said servicing for transmission via said communication link exceeds said threshold amount of data corresponding to said dynamic weight for said serviced memory;

... and

if said amount of data scheduled for transmission exceeds said threshold amount of data, decreasing said threshold for a next servicing of said serviced memory.

Regarding the use of dynamic weights, in the final office action the Examiner stated that

> it is the Examiner's contention that by placing a limit on the amount of time for a timing wheel, Delp provides means for maintaining a dynamic weight for the memories wherein the weight corresponds to a threshold amount of data according to the time and the established bit rate.

Applicant is unsure what "placing a limit on the amount of time for a timing wheel" means. The timing wheels of Delp apparently cycle continuously, and the "time" measured by a timing wheel is measured in slots, not convention time unit (i.e., seconds, minutes). If it is the length of time associated with one time slot that is meant by this phrase, then it is incorrect, because Delp does not alter the size of slots in a timing wheel. Even if it is the *number* of slots to which a queue is assigned, Applicants still disagree with the contention. Delp only schedules one slot at a time. Each time a queue is serviced during a slot, its next slot is assigned (e.g., column 6, lines 26-41; column 6, lines 47-53).

B. Claims 11-22, 24

The rejections of claims 11 and 24 are traversed for the reasons stated in sections I and II.A above.

In addition, claims 11 and 24 recite the following:

> in a first servicing turn of said first memory:
> determining whether one of said first weight and said second weight has changed;

When Delp is scheduling data from one LCD during a slot, it does not consider any other LCDs. Therefore, even if Delp could be interpreted as teaching the use of dynamic weights corresponding to threshold amounts of data, Delp does not look at one LCD's parameters when servicing another.

C. Claims 25-31

The rejections of claims 25-31 are traversed for the reasons stated above in sections I and II.A.

CONCLUSION

No new matter has been added with the preceding amendments. It is submitted that the application is in condition for allowance. Such action is respectfully requested. If prosecution of this application may be facilitated through a telephone interview, the Examiner is invited to contact Applicant's attorney identified below.

Respectfully submitted,

Date: January 5, 2004

By: Daniel Vaughan 42,199
Daniel E. Vaughan (Registration No.)

Park, Vaughan & Fleming LLP
702 Marshall Street, Suite 310
Redwood City, CA 94063
(650) 474-1973: voice
(650) 474-1976: facsimile